

Meter Scale Urban Land Cover Green Bay, WI

Land cover (LC) is the surface components of the land that are physically present and visible, and provides a means to examine landscape patterns and characteristics. This layer is a high spatial resolution urban land cover (ULC) map that quantifies the type and areal extent of the material composition at earth's surface, such as trees, grass, impervious surfaces, water and barren land. It is a foundational layer for the EnviroAtlas community component that serves as input to approximately 85 sustainability and ecosystem services data layers. These ULC data are derived from one-meter-pixel aerial photos, and represent the detailed biophysical landscape of urban life and infrastructure. The ULC classes are similar to the National Land Cover Data (NLCD), but at higher spatial resolution: there are approximately 900 ULC pixels inside the footprint of one 30x30 m NLCD pixel.

Why is land cover important?

Land cover is the foundation of the terrestrial biosphere, the zone of life on land. LC is the matrix of surface materials in which cities are embedded. LC data are necessary to sound urban planning and sustainable development. Anticipated users of these data include city and county environmental decision makers, water authorities, wildlife and natural resource managers, citizens, teachers and students. Some potential applications of this map include: stormwater and urban heat island mitigation; habitat, wildlife corridors and riparian buffers; recreation and access to green space; urban forestry; conservation; and urban landscape ecology. LC data at this high spatial resolution (1 m pixel) are rare. Created from aerial photography, the EnviroAtlas ULC data present a "birds-eye" view that can help identify important features, patterns and relationships in the landscape. Each land cover class has characteristic biophysical properties and processes that contribute to a healthy urban environment.

How can I use this information?

The ULC data can be used alone or combined visually and analytically with other GIS layers. Approximately 85 EnviroAtlas data layers and metrics incorporate meter-scale urban land cover in their computation, including:

- sulfur dioxide removed (\$/yr)
- Percent tree cover within 15 m of roadway
- Reduction in median load of nitrites and nitrates, phosphorous, suspended solids, etc. (kg/yr).

This layer shows land cover patterns that control or influence human and ecosystem health in the urban landscape, and supports numerous lines of investigation. Where are the green and grey spaces? Which streets need more trees? What areas are mostly impervious surface and subject to urban heat island and stormwater runoff effects? Do urban streams have healthy vegetated buffers?

Viewing tip: use the Transparency Slider to explore how land cover relates to imagery and other EnviroAtlas layers. Experiment with multiple layer blending using 50-100% transparent land cover overlaid on an imagery basemap. The Transparency slider bar is in a dropdown list from the **i**-button to the right of the map layer name.

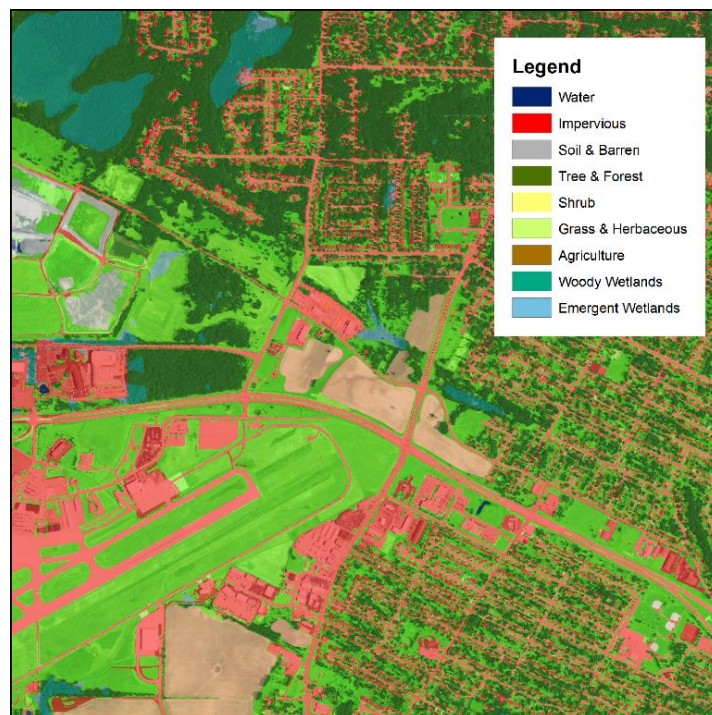


Figure 1 Green Bay, WI urban land cover overlaid on air photo. Each color represents a specific LC class. Note the fine spatial detail showing individual buildings, trees, and roads.

- Total carbon stored in above ground biomass (mt)
- Reduction in annual stormwater runoff (m³/yr)
- Value of asthma exacerbation cases avoided due to

How were the data for this map created?

These data were generated from digital image processing, air photo interpretation and supervised classification of aerial photography from the United States Department of Agriculture (USDA) National Agricultural Imagery Program (NAIP)³. NAIP characteristics include three visible and one near infrared spectral bands, one meter pixel size, nation-wide availability on a three year update cycle, and low to no cost.

A machine learning, automated feature extraction software was used in supervised classification to identify six common land cover classes: Impervious Surface, Soil-Barren, Grass-Herbaceous, Tree-Forest, Agriculture, and Water. Ancillary data were used to map two additional land cover classes: Wetlands (Woody and Emergent) and some water bodies (U.S. Fish and Wildlife Service, 2013)⁴. Hand editing was used as needed. Data were organized and manipulated in a GIS. A full description of the remote sensing classification techniques is given in each city's metadata. What are the limitations of these data?

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All land cover maps are, by their nature, imperfect, and the metrics generated from land cover maps cannot be taken as absolute truth, but as the best estimation of that truth based on the best available data. An accuracy assessment was conducted using approximately 100 photo-interpreted reference points per class. The Green Bay, WI land cover has an overall User's Accuracy of about 90 percent. Full accuracy results are reported in the map metadata. Accuracy

information for the source data sets can be found on their respective web sites and metadata.

How can I access these data?

EnviroAtlas data can be viewed in the interactive map, accessed through web services, or downloaded. To acquire the imagery data, wetland data, or water data used to generate this land cover, please visit the respective web sites for those datasets.

Where can I get more information?

To learn more about the societal benefits associated with land cover in general, there are many resources in the literature and on the internet. A small subset of these resources has been listed in the selected publications section below.

In-depth information on the relationships between urban ecosystems, such as green space, and human health and well-being can be found in EPA's Eco-Health Relationship Browser. For additional information on how the data were created or their limitations, access the metadata for the data layer. To ask specific questions about these data, please contact the EnviroAtlas Development Team.

Acknowledgements

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Selected Publications

¹ U.S. Geological Survey, 2013b, National Land Cover Database (NLCD): U.S. Geological Survey database, <http://www.mrlc.gov/finddata.php>

² Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A Land Use and LC Classification System for Use with Remote Sensor Data. Geological Survey Professional Paper 964, U. S. Dept. of Interior.

³ U.S. Department of Agriculture, Farm Service Agency, 2013, Aerial Photography Field Office: U.S. Department of Agriculture Web page, <http://www.fsa.usda.gov/FSA/apfoapp?area=home&subject=prog&topic=nai>.

⁴ U.S. Fish and Wildlife Service, 2013. National Wetlands Inventory digital data. Website: <http://wetlands.fws.gov/>

⁵ Myeong, S., D.J. Nowak, P.F. Hopkins, and R.H. Brock. 2001. Urban cover mapping using digital, high-spatial resolution aerial imagery. *Urban Ecosystems* 5: 243–256.